Paired Forceps

Background of the Invention

The present invention relates to forceps, and, in particular, to two sets of forceps that are paired together to permit one person to perform a function that usually requires two people, each holding a forceps.

When a surgeon is performing surgery and is joining two adjacent edges of tissue together, the surgeon usually grasps one tissue with a pair of forceps and, in the other hand, holds a stapler or other joining device. The surgeon depends upon an assistant with a second pair of forceps to grasp the second tissue in order to bring the two tissues together, and the surgeon then staples or otherwise joins the tissues. Any type of tissue may be involved, such as skin, blood vessel walls, or visceral edges.

It has been recognized in the prior art that it would be desirable to devise a mechanism that would permit the surgeon to join the two edges of tissue together using only one hand, leaving the other hand free to hold a stapler, needle driver, or other device for securing the tissue edges together. Simultaneous elevation of the edges so

grasped would obtain an eversion of the tissue edges that are coapted, a desired consequence in tissue closure. However, the prior art devices of which we are aware are difficult to use with any precision and are unfamiliar to the surgical hand.

Summary of the Invention

The present invention provides a device that permits a surgeon to grasp two adjacent edges of tissue and draw them together using just one hand. This device uses two pairs of forceps that are attached together in such a way that the surgeon can insert his finger down between the two pairs in order to have good control of both pairs. The index finger lying between the two forceps can provide oppositional pressure in two directions at once, and it permits the surgeon to use intuitive skills to bring the tissue edges together.

Brief Description of the Drawings

Figure 1 is a perspective view of a first embodiment of a gripping device made in accordance with the present invention;

Figure 2 is a front view of the gripping device of Figure 1;

Figure 3 is a side view of the gripping device of Figure 1;

Figure 4 is an enlarged view of the tip portion of the gripping device of Figure 1;

Figure 5 is a perspective view showing the gripping device of Figure 1 in use;

Figure 6 is the same view as Figure 5, showing the gripping device gripping a first edge of tissue;

Figure 7 is the same view as Figure 6, but showing the gripping device gripping the second edge of tissue and bringing it together with the first edge, and showing some staples in place to secure the tissue edges together;

Figure 8 is a perspective view of a second embodiment of a gripping device made in accordance with the present invention;

Figure 8A shows the gripping device of Figure 8 in use;

Figure 9 is a perspective view of a third embodiment of a gripping device made in accordance with the present invention;

Figure 10 is a perspective view of a fourth embodiment of a gripping device made in accordance with the present invention; and

Figure 11 is a top view of the gripping device of Figure 10.

Description of the Preferred Embodiments

Figures 1-7 show a first embodiment of a gripping device 10 made in accordance with the present invention. The device 10 includes two pairs of forceps 12, 14, each made in a traditional way. Each pair of forceps 12, 14 includes first and second legs 16, 18 joined together at a hinge joint 20 at one end and having pointed gripping tips 22 at the other end. While this embodiment shows one type of gripping tip 22, many different types of gripping tips are known in the art and could be used, depending upon the type of tissue being joined. Similarly, while this embodiment shows one type of hinge joint 20, other types of hinge joints are also known and could be used. The hinge joint 20 restricts the relative motion between the inner and outer legs 18, 16 to motion within a plane.

Figure 2 has arrows showing the direction of relative motion of the legs, and, in this view, the plane of motion for both pairs of forceps is the plane of the paper. The outer legs 16 are moved inwardly toward the inner legs (or, if an outer leg 16 is stationary, its respective inner leg 18 may move outwardly toward the outer leg), moving along the plane of the paper, until the gripping tips 22 come together to grip the tissue.

The legs 16, 18 are made of a spring material, so that a force is required to press the legs 16, 18 together in order to bring the tips 22 together, and, when that force is released, the legs 16, 18 return to their initial position, with the tips 22 separated as shown in Figure 2.

The inner legs 18 of the two pairs of forceps 12, 14 are joined at the connection point 23, adjacent to their second (or gripping) end. While this connection point 23 is preferred, it is possible for the legs to be rigid enough that they do not have to be connected at their tips as long as they are joined together somewhere. They are also joined above the connection point 23 by two substantially rigid rings 24, 26, which function as spacers, holding the upper portions of the inner legs 18 above the connection 23 a fixed distance apart. (Other embodiments use other types of spacers, such as a spiral.) The first ring 24, lying closer to the connection 23, preferably has a smaller diameter than the second ring 26 in order to conform to the shape of the forceps. Also, in this preferred embodiment, the first ring surrounds the inner legs 18, while the second ring lies between the inner legs 18. In this preferred embodiment, the connection 23 is formed by welding, and the rings 24, 26 are welded to the inner legs 18. However, many other known connecting mechanisms could be

used, including bolting, riveting, and forming as a unitary piece, for example. Both the connection 23 and the rings 24, 26 control the relative positions of the two pairs of forceps so that both pairs operate in the same plane of motion.

In order to use the gripping mechanism 10, the surgeon inserts a forefinger through the rings 24, 26 and puts a thumb against one of the outer legs 16 and another finger (preferably the middle finger) against the other of the outer legs 16. By adjusting the pressure between the fingers, the surgeon can control the amount of gripping force that is applied by each of the forceps 12, 14.

Typically, the surgeon will first grip a first edge of tissue 30 with the first pair of forceps 12 held between the forefinger and thumb, as shown in Figure 6. Then, the surgeon will move the device 10 toward the second edge of tissue 32 and pick up that tissue edge with the second pair of forceps 14, thus holding the two tissue edges 30, 32 together with the two adjacent pairs of forceps 12, 14. The surgeon's other hand will then be free to apply staples 34, sutures (not shown) or other connectors to hold the tissue edges together.

While it is not absolutely necessary to have the rings 24, 26, and the gripper could function without them, it is preferred to have

some type of substantially rigid spacer holding the upper portions of the inner legs 18 apart a fixed distance. If there were no spacer, the surgeon would have to use his forefinger to apply force in both directions at the same time in order to keep the upper portions of the legs 18 apart. With the spacer in place, holding either one of the upper leg portions of the inner legs 18 in position automatically positions the upper portion of the other inner leg 18. Thus, it is easier to use the device if some type of upper spacer is present than if a spacer is not present.

While the first embodiment shows the use of two rings 24, 26, other spacing arrangements could be used. For example, Figures 8 and 8A show the use of just a single ring 26A. The arrows 36, 38, 40, 42 in Figure 8A show the positions and the directions in which force is applied. The index finger can actually apply force in two directions at once, as shown by the arrows 36, 40, to independently control the force applied by the two pairs of forceps 12, 14.

Figure 9 shows the use of an S-shaped connector 26B. Figures 10 and 11 show an alternative spacer 26C, which is essentially the same as the S-shaped spacer 26B of Figure 9, but with the lower portion removed. Each of the spacers 26-26C defines

an opening, which permits the surgeon to insert a forefinger down between the two inner legs 18 of the gripper. The ability to insert the forefinger down between the inner legs 18 gives the surgeon far greater control over the gripper than would be possible if the forefinger could not be inserted between the inner legs 18.

It will be obvious to those skilled in the art that many modifications may be made to the embodiments described above without departing from the scope of the present invention.